Washington State
Department of Transportation

ADMINISTRATIVE MANUAL

Cost Estimating Guidance for WSDOT Projects

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Environmental and Engineering Programs
Strategic Analysis and Estimating Office

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Foreword

Each project is unique. To accurately develop an estimate of the construction costs for a project, an Estimator must be capable of mentally constructing the project and then accounting for all the activities necessary to complete it. Many of the best cost estimators are knowledgeable in both transportation design and construction.

Estimators should be shielded from pressures to keep estimates within programmed or desired amounts based on funding availability. Estimators should be free to establish what they consider to be a reasonable estimate based on the scope and schedule of the project and the bidding conditions (i.e., market) that are anticipated.

This guidance has been developed by the Strategic Assessment and Estimating Office (SAEO) in alignment with the goals of the Statewide Program Management Group (SPMG).

We would like to thank the dozens of key WSDOT people who participated in the review process for these guidelines.

Pasco Bakotich
WSDOT State Design Engineer

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Purpose

This document provides a consistent approach to cost estimating, estimate review, estimate documentation, and management of estimate data. At the same time, it provides guidance on how to treat the common and recurring challenges encountered in the estimating process. The underlying estimate assumptions noted in this document are intended to apply to projects typical to Washington State Department of Transportation (WSDOT) experience.

Assumptions should be adjusted as needed, utilizing sound professional judgment, in the case of unique projects or if project-specific conditions warrant.

Larger, more complex projects should go through an alternative analysis during the scoping phase to obtain a preferred alternative so that a more accurate cost estimate can be developed.

Definitions

Estimate - A quantitative assessment of the likely amount or outcome. Usually applied to project costs, resources, effort, and durations and is usually preceded by a modifier (i.e. preliminary, conceptual, order-of-magnitude, etc.). It should always include some indication of accuracy (e.g. ± x percent). (Source: PMBOK Third Edition)

Cost Estimate - A prediction of quantities, cost, and/or price of resources required by the scope of an asset investment option, activity, or project. As a prediction, an estimate must address risks and uncertainties. Estimates are used primarily as inputs for budgeting, cost or value analysis, decision making in business, asset and project planning, or for project cost and schedule control processes. Cost estimates are determined using experience and calculating and forecasting the future cost of resources, methods, and management within a scheduled time frame. Included in these costs are assessments and an evaluation of risks. (Source: Copyright 2004, AACE International, Inc., AACE International Recommended Practices)

Base Cost Estimate – The base cost represents the cost that can reasonably be expected if the project materializes as planned. Typically a variance is associated with the base cost. (Source: WSDOT working definition)

Cost-Based Estimate - A method to estimate the bid cost for items of work based on estimating the cost of each component (labor, materials, equipment, etc.) to complete the work and then adding a reasonable amount for a contractor's overhead and profit. (Source: WSDOT working definition)

Historical Bid-Based Estimate – This type of estimate tends to be a straightforward count or measure of units of items multiplied by unit costs. These unit costs are developed from historical WSDOT project bids and may be modified to reflect project specific conditions. This is the most common type of estimating at WSDOT. (Source: WSDOT working definition)

Parametric Estimate – A method to estimate the cost of a project or a part of a project based on one or more project parameter. Historical bid data is used to define the cost of a typical transportation facility segment, such as cost per lane mile, cost per interchange or cost per square foot. Historical percentages can be used to estimate project segments based on major project parameters. These methods are often used in early estimating, such as planning and scoping estimates. (Source: WSDOT working definition)

Risk-Based Estimate – Involves simple or complex modeling based on inferred and probabilistic relationships among cost, schedule, and events related to the project. It uses the historical data and/or cost based estimating techniques and the expert's best judgment to develop a Base Cost or the cost of the project if the project proceeds as planned. Risk elements (opportunities or threats) are then defined and applied to the Base Cost through modeling to provide a probable range for both project cost and schedule. (Source: WSDOT working definition)

Engineers Estimate - Typically the final estimate prior to advertisement. This estimate is loaded into EBASE and locked prior to Ad. The project should have an accurate, complete Engineers Estimate PRIOR to going to advertisement. Revising an Engineers Estimate during the Ad period should be the exception, not the rule. (Source: WSDOT working definition)

Construction Engineering (CE) – The project management effort (budget/cost) of taking a project from contract execution through construction and project completion.

Construction Contingency – A markup applied to the base cost to account for uncertainties in quantities, unit costs, and minor risk events related to quantities, work elements, or other project requirements during construction. This amount is covered in the Plans Preparation Manual, 830.03.

Miscellaneous Item Allowance Design Allowance – An amount set aside to cover items that have not yet been estimated individually, especially early in design when these details are not yet known, such as drainage, signal systems, illumination, erosion control, environmental, landscape, etc. This can also cover unknowns in quantities such as earthwork or paving.

Preliminary Engineering (PE) – The effort (budget/cost) of taking a project through the planning, scoping, and design phases. Planning and scoping typically have separate budgets but are encompassed under Preliminary Engineering.

Risk – The combination of the probability of an uncertain event and its consequences. A positive consequence presents an opportunity; a negative consequence poses a threat.

For additional definitions, refer to the Master Glossary at:

http://www.wsdot.wa.gov/NR/rdonlyres/76111703-D435-4CB7-A965-1297F7F00599/31262/CREMGlossary%202007MAR.doc

Cost Estimating Process

All projects benefit from following a thoughtful and deliberate process in developing project cost estimates. The process presented in Figure 1 describes the way WSDOT develops its project cost estimates. It is applied to all levels of project delivery, starting with the planning level estimate and ending with the project design and plan, specification, and estimate (PS&E) level. Each level of estimate requires different inputs, methods, techniques and tools.

This process was developed by WSDOT to support the development of consistent and accurate cost estimates through all phases of the project development process. It has since been published by the National Cooperative Highway Research Program in NCHRP Report 574, which is available at the WSDOT library. This process is applicable for cost estimates developed internally by WSDOT or for WSDOT by consultants. If a project manager needs assistance selecting a consultant to provide cost estimating services or expertise, please contact the SAE Office at (360)705-7452 for a list of on-call consults that are available.

The task of cost estimating, by its very nature, requires the application of prudent judgment to the completion of the task.

A short description of each step in the cost estimating process is presented below. More details are available on the web site at: www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/Process/

Determine Estimate Basis

This activity focuses on obtaining project information, including project scope details and data, from which a project cost estimate can be prepared. The level of scope detail varies depending on the project phase, project type, and project complexity, but would include the design matrix and criteria, all assumptions and pertinent scope details. This work should be clearly documented and forms the beginning of the estimate file that should be prepared for each estimate. Each of the following steps will add information to this file, with the end result being a complete traceable history for each estimate.

Prepare Base Estimate

This activity covers the development of estimated costs for all components of a project. These components may be estimated using different techniques depending on the level of scope definition and the size and complexity of the project. The number and detail of components estimated may vary depending on the project development phase. For example, in the scoping phase the cost estimate covers preliminary engineering, Right Of Way (ROW), and construction. As the design progresses and more details are known, pieces of the estimate become more detailed. Key inputs to this activity include project scope details, Historical Databases and other cost databases, knowledge of Market Conditions, and use of Inflation Rates. WSDOT has internal specialty groups that should be used to provide estimate information when preparing base estimates.

A required component of the base estimate step is the preparation of a Basis of Estimate document that describes the project in words and includes underlying assumptions, cautionary notes, and exclusions. The base estimate should also be based upon and should include as an attachment for reference the associated schedule. For conceptual level base estimates the schedule will be cursory and very broad in its coverage.

However, as a minimum it should have the major milestones that WSDOT uses for projects. It may only have a few activities, but should begin with the development of the project, and include ROW, design, and construction.

Document the Assumptions, Notes, Exclusions and References in the Basis of Estimate Document

All important underlying assumptions used in developing the Base Estimate must be discussed in the Basis of Estimate document. This will include, but not be limited to, the effect of jobsite conditions on labor rates and productivity, and material/equipment costs; crew/equipment compositions for major items of work that are considered "cost drivers" to the overall estimate and how these composition assumptions translate into unit rates; sequence-of-work assumptions that may not be obvious in the accompanying project schedule; traffic management assumptions; and work calendar assumptions, to include whether certain work must be performed at night or on weekends and why this is the case; why allowances were used for a given item as opposed to more detailed quantity-based cost estimates. Also include notes that highlight the methodology used in developing the estimate (refer to the Cost Estimating Methodology section below) plus any important remarks on individual items of work.

Clearly state exclusions to ensure no misunderstanding on the part of the reader. All documents used as references or resources upon which the estimate was based should be listed in a way similar to the formality of a bibliography, including revision numbers and document dates. As noted above, the Basis of Estimate is a component of the Base Estimates.

Review Base Estimate

This activity is necessary to ensure that (1) the base cost estimate is an accurate reflection of the project's scope of work; (2) items are not missing; (3) historical data, the cost based estimate, or other data that was used reasonably reflects project scope and site conditions; and (4) assumptions and basis are appropriate for the project. Internal specialty groups and/or Subject Matter Experts (SMEs) must participate in reviewing the base estimate.

Determine Risks and Set Contingency

This activity is part of developing a risk management plan for a project, as identified in the Project Management Online Guide. Risk management is the process of maximizing the probability and consequences of positive risk events (opportunities) and minimizing the probability and consequences of negative risk events (threats) to the project objectives. In the context of cost estimating, the cost impact of project risks (favorable or unfavorable) must be included to derive a total project cost.

If necessary, internal and/or external specialists are involved in a workshop format to validate the base estimate, provide input on specific issues such as construction staging, and elicit risks for modeling purposes. Formal risk assessment at WSDOT typically occurs in workshops such as Cost Risk Assessment (CRA) and Cost Estimate Validation Process (CEVP) workshops, and considers market conditions and inflation rates in order to determine Year-of-Expenditure (YOE) cost(s). Risk assessment techniques are a valuable and valid tool and should be applied to all estimates.

Determine Estimate Communication Approach

Cost estimate data is communicated to both internal and external constituencies. The communication approach determines what estimate information should be communicated, who should receive this information, how the information should be communicated, and when the information should be communicated. Cost estimate information should be included when the communication plan is developed as part of the project management process. Often the words are as important as the numbers. The Basis of Estimate document can be used effectively as a communication tool to convey key information about the project to others.

Conduct Independent Review and Obtain Management Endorsement

Estimates are key products of the project management process and are fundamental documents upon which key management decisions are based. Given their importance, all estimates should receive an independent review, and should then be reconciled and revised as needed to respond to independent reviewer comments. Once independent review comments have been satisfactorily incorporated, estimates should be presented to management staff for approval.

Management approval of first issue estimates developed for initial budgeting or baseline definition is a defined step in the project management process. Revised estimates, typically developed if project requirements change, or as design is developed, should be reviewed by management staff, revised as necessary to reflect management comments, and then approved. These revised estimates will then be incorporated into project cost baselines through the established project change management process.

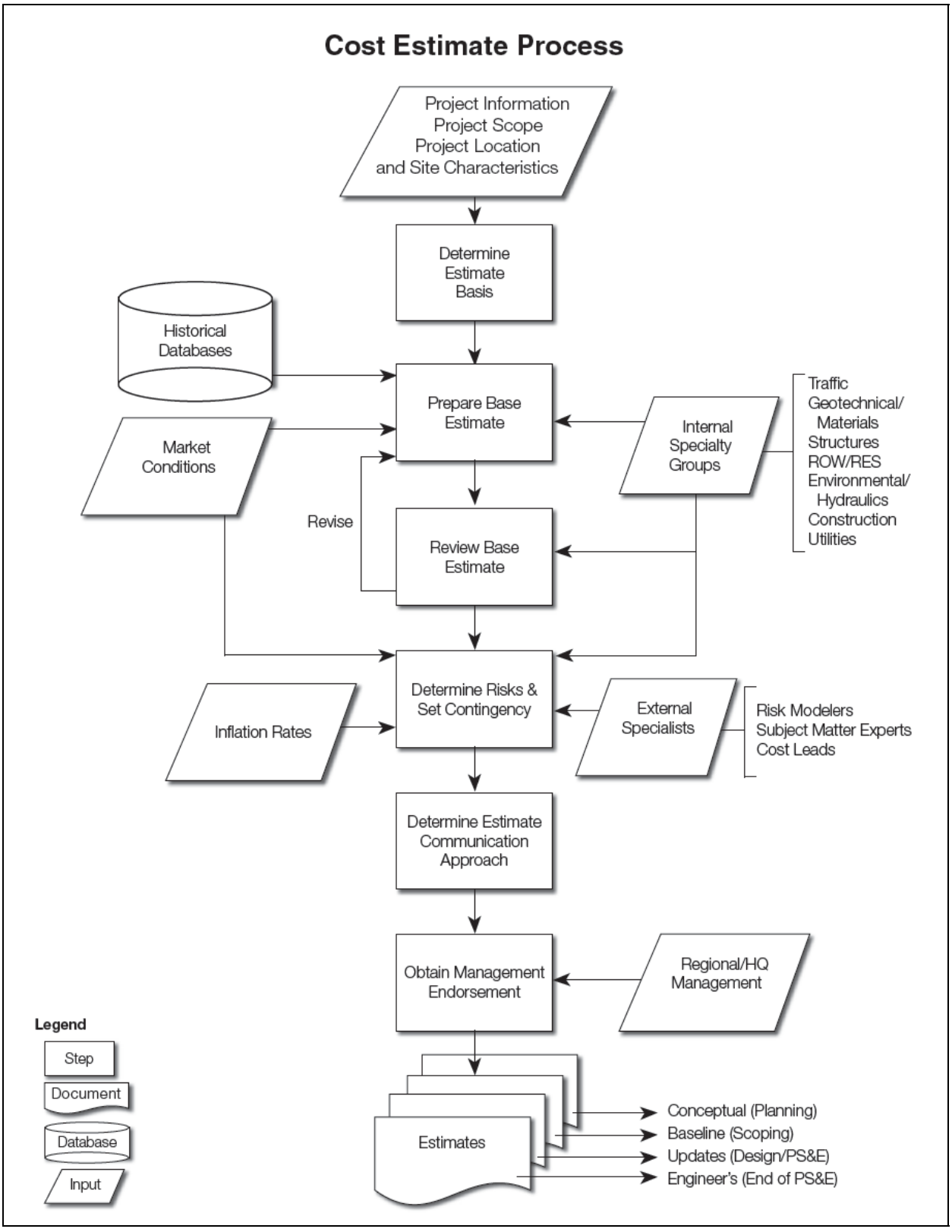

Figure 1: Cost Estimating Process

Estimating methodologies fall into one of four categories: parametric, historical bid-based, cost based and risk-based. These categories encompass scores of individual techniques/tools to aid the Estimator in preparing cost estimates. It is important to realize that any combination of the methods may be found in any given estimate. WSDOT is currently evaluating WinEstimator, a new software tool for use in estimating. This type of tool will support parametric, historical bid-based and cost based estimating methods. Two specialty items, bridges and non-standard retaining walls, are both estimated by the HQ Bridge and Structures Office and are covered at the end of this section. Other specialty items such as Right Of Way are covered under Important Factors

Parametric methods are applied to projects in the planning, scoping, or early design stage, and involve techniques that use historical data to define the cost of typical transportation facility segments, such as cost per lane mile, cost per interchange, cost per square foot, and cost per intersection. Typically the historical bid prices used to develop the estimate come from previous projects awarded by WSDOT out of databases such as EBASE or BidTabs Professional. Two techniques that are commonly used in parametric estimating are 1) analogous (similar) projects and 2) historical percentages. WSDOT has other commercial estimating software available that can support parametric estimating for projects for which WSDOT does not have relevant historical data. Two tools that employ parametric methods include:

- Mobility Project Prioritization Process (MP3), which is an Excel workbook. http://www.wsdot.wa.gov/mapsdata/tdo/mobility.htm
- Planning Level Project Cost Estimating (PLCE), which is an Access database.

Historical bid-based methods are commonly used to develop WSDOT Engineer's Estimates, and are appropriate when design definition has advanced to the point where quantification of units of work is possible. These methods apply historical unit costs to counts or measures of work items to determine a total cost for the item or project. The unit cost data used is typically received by WSDOT in bid documents from prior projects and should be modified or adjusted to reflect current prices (inflated to current time) and project specific conditions. Techniques such as historical bid pricing, historical percentage, and cost based estimating are also used to determine unit prices. Historical cost data sources include:

- E-base
- BidTabs Professional
- Unit Bid Analysis
- RS Means, where WSDOT-specific unit costs are not available

Cost-based estimate methods do not rely on historical WSDOT bid data, but rather are based on determining, for an item or set of items, the contractor's cost for labor, equipment, materials and specialty subcontractor effort (if appropriate) needed to complete the work. A reasonable amount for contractor overhead and profit is then added. This method is preferable on unique projects or where geographical influences, market factors and the volatility of material prices can cause the use of historical bid-based methods to be unreliable. Also, since contractors generally utilize a cost-based estimating approach to prepare bids, this method can provide more accurate and defensible costs to support the decision for

contract award/rejection and to support any future price negotiations with the contractor after contract award.

Cost-based estimates require significant effort, time, and estimator experience to prepare. They should be limited to those items that comprise the largest dollar value of the project, typically that 20% of items of work containing 80% of project cost. The cost of the remainder of estimate line items can be determined using Historical Bid-Based Estimate methods. This approach provides for a more efficient use of estimating resources and reduces the total time and cost of preparing Cost-Based Estimates. Cost based estimating is a good way to check a few large items of work in a historical bid based estimate to ensure that the historical prices are still valid.

Risk-based estimate methods involve simple or complex analysis based on inferred and probabilistic relationships between cost, schedule, and events related to the project. It uses a variety of techniques, including historical data, cost based estimating, and the best judgment of subject matter experts for given types of work, to develop the Base Cost (the cost of the project if all goes as planned). Risk elements (opportunities or threats) are then defined and applied to the Base Cost through modeling to provide a probable range for both project cost and schedule. Depending on the project's magnitude, complexity, and controversy, the following tools are available to develop a risk based estimate:

1. Cost Estimating and Validation Process (CEVP) workshops which includes external subject matter experts

2. Cost Risk Assessment (CRA) workshops, typically held in-house

3. Small, internal workshops using the Self-Modeling Excel workbook

Bridges and Non Standard Retaining Walls and Structures are estimated by the Headquarters (HQ) Bridge and Structures Office.

The HQ Bridge and Structures Office maintains a database of historical structure costs and bid information. This HQ Bridge and Structures Office database is more current than information available through Unit Bid Analysis or other published WSDOT sources. Since bridges and structures are in their field of design and construction responsibility, the HQ Bridge and Structures Office is in a strategic position to interpret and establish structure costs for a project at any point during project development , from initial planning through PS&E completion.

For Planning and Scoping estimates, contact the Bridge Projects Unit in the HQ Bridge and Structures Office. They will help prepare the estimate using historical bid based methods, type, site, location and most current market conditions and prices for the specific bridge and structure types that meet project specific conditions. For Design and PS&E estimates the Bridge Projects Unit in the HQ Bridge and Structures Office will provide a detailed, cost based estimate for these structures. Estimators should take care to understand what is included and is not included in estimates from support offices, and request documentation supporting the estimate for their estimate file.

An estimator calculates the cost of work items, then applies markups such as mobilization, sales tax, preliminary engineering (PE), Miscellaneous allowance in Design (only for historical bid-based, cost-based, and risk-based methods), and construction engineering (CE). Table 1 presents a summary of recommended values for various elements.

Cost Estimating Elements	Planning	Scoping	Design	PS&E
Identification of Work Items	> $50,000	> $10,000	All Items	All Items
Mobilization	Per Plans Preparation Manual, 830.02			
Sales Tax	Site-specific, based on Control Section. Data can be found in TRIPS or EBASE			
Preliminary Engineering	See Table 3		PM's Workplan + Actuals to Date	Actual
Miscellaneous Item Allowance in Design[3]	30% to 50%	20% to 30%	10% to 20%	0% (all items should be defined)
Contingency	Applies to parametric, historical bid-based and cost-based estimates only. Per Plans Preparation Manual, 830.03			
Construction Engineering	Per Plans Preparation Manual, 830.03			

Table 1: Markups Summary

Notes:

1. Round final cost estimate to the nearest appropriate significant digit, usually third or fourth from left for scoping through design. For example, $196,526,918.00 could be rounded to $196 million.
2. Report cost estimates in current dollars to program management. The Construction Cost Index (CCI) will be used to inflate the estimate to midpoint of construction by program management.
3. Miscellaneous Item Allowance in Design accounts for lack of scope definition and those items too small to be identified at that stage of the project. This allowance is eliminated entirely in PS&E estimates as the scope will then be fixed and all estimate items should be identified.

Cost Estimating and Project Development Level

There are four main project levels of project development:

1. Planning
2. Scoping
3. Design
4. Plans, Specifications and Estimate (Engineer's Estimate)

The estimate for each level of project development has a specific purpose, methodology, and is expected to have a certain level of accuracy. Table 1 summarizes the relationship that exists between project development levels, purpose of the estimate, estimating methods, and the estimate's level of accuracy. Note the inverse relationship between the project development level and the expected accuracy range. Some of the typical causes of construction cost uncertainty are lack of scope definition, multiple alternatives, and lack of information about factors outside the roadway prism (ROW, community, cultural, environmental, and inflation). As the project progresses, more data is available and the expected accuracy range narrows.

Planning

The planning level estimate is used during the Project Definition and Project Initiation and Alignment phases to estimate probable funds needed for long range planning and to prioritize needs for the Highway System Plan. These estimates are prepared with little project definition.

Techniques

Parametric estimating techniques are often used for planning estimates. Lane mile and centerline mile are two types of parametric estimating techniques. **Historical bid prices** and **historical percentages** can be used to generate costs from these parameters. **Analogous project** estimating is another approach that can be used. Commercial estimating programs are available to assist in parametric estimating, especially for projects that have little or no historical data available in WSDOT databases.

WSDOT has two tools that employ parametric methods:

- Mobility Project Prioritization Process (MP3), which is an Excel workbook. http://www.wsdot.wa.gov/mapsdata/tdo/mobility.htm
- Planning Level Project Cost Estimating (PLCE), which is an Access database.

Concerns

When using analogous project estimating, the chosen historical project must be truly analogous. Finding an appropriate project or projects and determining the similarities and differences between the historical projects and the current project can take significant

time and effort. Project data from older projects is less reliable due to variations in prices, standards, construction technology, and work methods. The analogous method is best used as a tool to determine broad price ranges for simple, straight forward projects or as a check to verify estimates prepared using another method.

- Given the large-scale assumptions inherent in Parametric Estimating methods, the estimator must document all assumptions clearly.

- Provide an adequate range of costs that reflects the unknowns in the project (see Table 2 below). This can be accomplished through allowances in the estimate for those items not yet defined or quantified.

- Keep the estimate current as the project waits to move on to scoping.

Scoping

A scoping level estimate is used during the Project Planning and Endorsement phase to set the baseline cost for the project and to program the project. A project is programmed when it is put into the Capital Improvement and Preservation Program (CIPP) and the Biennial Transportation Program. The scoping estimate is important because it is the base line used by the Legislature to set the budget and all future estimates will be compared against it. Clearly document assumptions and scope definitions in the Basis of Estimate document so that all future changes can be accurately compared to this estimate.

Techniques

Historical Bid-Based, Cost-Based, Parametric and Risk-Based: The estimator will be able to determine approximate quantities for items such as asphalt, concrete pavement, structures, or roadway excavation. For such quantifiable items, Historical Bid-Based or Cost-Based estimating methodologies should be used for pricing. Other items not yet quantified may be estimated parametrically or through the use of historical percentages. Risks should be identified, a Risk Management Plan developed and included in the estimate notebook for future reference.

Concerns

- **Prepare estimate notebook.** All changes, assumptions, and data origins should be clearly documented. This is particularly important because any future estimates will be compared with this one to justify changes in the cost of the project.

- Estimators should guard against false precision; that is assuming a level of precision that is not inherent in this type of estimate. Although a properly developed estimate will include well documented assumptions, many of the details that impact project cost are not defined at the time the estimate is done. Miscellaneous item allowance in design at this level of design definition typically ranges from 20% to 30%, and even higher on non-standard projects (see Table 2 below). This includes rounding costs (and quantities) to an appropriate significant figure.

- It is important to choose the correct unit costs for major items and then correctly inflate those costs to current dollars.

- Use sound risk elicitation to identifying of the major risks.

Design

Estimates prepared at the various design levels, including Geometric Review, General Plans Review, and Preliminary Contract Review, are used to track project costs in relation to the current budget (CIPP or "Book" amount). Each time the estimate is updated the Cost Estimate Process detailed in Figure 1 should be followed. The project cost budgeted should be compared to the new estimate. Clearly document each of these updates in relation to the previous estimate and included in the estimate file. If the budget or scope of the project needs to be updated, fill out and submit a Project Change Request Form. The final Engineers Estimate, along with supporting documents, is required to be filed in the Design Documentation Summary (DDS).

Design approval is an important stage of design for estimating purposes. At design approval the configuration of the project is known. This will solidify many items in the scope such as Right of Way, likely permit conditions, environmental mitigation, quantities of major items and outside stakeholders. As scope definition improves, the accuracy of the estimate will likewise improve. The work effort required to prepare, document and review the estimate also increases.

Techniques

Historical Bid-based, Cost-based and/or Risk-based. As design definition advances, design engineers and estimators are better able to determine project work items and their associated quantities and unit prices. Historical Bid-based methodologies are typically used for items of work for which historical data is available. Cost-based estimating methodologies can be used for those items with little or no WSDOT bid history, or for major items of work that are project "cost drivers". Key resources are suppliers and other individuals knowledgeable about current prices for the subject items, typical construction methodology and production rates, and equipment used. The estimator should contact them to develop basic cost data for materials, labor and equipment. Review risks identified earlier in the project development process and update the Risk Management Plan to reflect the current design level and risks.

Concerns

As with the Scoping Estimate mentioned above, estimators should guard against false precision – thinking they know more about a project than they do. Significant project definition continues to be developed until the project is ready for advertisement. Use appropriate item allowances and ranges for estimates (see Table 2, *Cost Estimating Matrix*).

If cost based estimating techniques are used, pay special attention to documenting all of the assumptions that are made in the development of unit prices such as the crew size, crew make up, production rates, equipment mix and type. The costs assumed for contractor overhead, profit and subcontractor work should also be clearly documented. It is important to remember that these decisions may not reflect the decisions of the individual contractors that will bid the job, and thus introducing elements of risk into the estimate.

PS&E / Engineer's Estimate

The Engineer's Estimate is prepared for the Final Contract Review in preparation for advertisement and is used to obligate construction funds and to evaluate contractor's bids.

Techniques

Historical bid-based, Cost-based and Risk-based. The project has matured to a point that design engineers and estimators are able to specify all items of work that will be required for the project and estimate quantities and unit prices. The project estimate has the advantage of detailed understanding of scope and project conditions. If the estimators are from outside the project team, they should take special care to understand the details of the project, including performing a detailed review of the plans and specifications. All quantities and unit prices should reflect current knowledge at the time of the estimate. Clearly document the development of and adjustments to line item quantities and prices. This is critical for the review of the estimate and review of bids prior to award. This data should be clearly defined and identified in the estimate file. Historical Bid-based methodologies should be used for most items of work where historical data is available. Cost-based estimating methodologies can be used for those items with little or no WSDOT bid history, or to check major items of work that pose significant impact on total project cost. Review the risks again and update the Risk Management Plan.

Concerns

Reviews of these types of estimates should be extensive and detailed and should include final QA/QC checks of calculations, prices and assumptions. The Basis of Estimate and overall estimate documentation package should be carefully reviewed to make sure that it is complete, accurate and easily understood, and that all figures, from detailed backup to summary levels, are traceable.

Project Development Level	Project Maturity (% of design completed)	Purpose of Estimate	Methodology	Estimate Range
Planning Washington Transportation Plan Highway System Plan Design Studies Route Dev. Plans	0% to 2%	Screening or Feasibility WTP/HSP (20 Year Plan) WTP – Washington Transportation Plan HSP – Highway Systems Plan	Risk-based or Judgment Historical % Similar Projects Parametric MP3 PLCE	-50% to +200%
	1% to 15%	Concept Study or Feasibility Implementation Plan (10 Yr. Plan)	Parametric MP3, PLCE Analogous Projects Historical % Risk-based CEVP CRA Self-Modeling	-40% to 100%
Scoping Project Summary (PD, DDS, ERS)	10% to 30%	Budget Authorization or Control Capital Improvement & Preservation Plan (CIPP)	Parametric MP3, PLCE Analogous Projects Historical bid-based (UBA, BidTabs Pro) Risk-based CEVP, CRA Self-Modeling	-30% to +50%
Design Design Documentation I/S Plans for Approval Design Approval	30% to 90%	Design Estimates (Project Control of Scope Schedule Budget)	Historical bid-based (UBA, BidTabs Pro, EBASE) Cost-based Risk-based CEVP CRA Self-Modeling	-10% to +25%
PS&E Plans, Specs, Estimate (R/W Plans approved)	90% to 100%	Engineer's Estimate (prior to bid)	Historical bid-based (UBA, BidTabs Pro, EBASE) Cost-based Risk-based Self-Modeling	-5% to +10%

Table 2: Cost Estimating Matrix

Cost Estimate Training

Several classes are offered by WSDOT that specifically address cost estimate preparation. Most are available in ATMS. These include:

- CZV: Introduction to Cost Estimating
- A4J: Contract Plans and Estimate Preparation
- CZ2: Risk-Based Transportation Cost and Schedule Estimating
- NHI – Risk Management Class (not is ATMS)

Resources from the Strategic Analysis and Estimating Office are also available to assist with specific questions about estimate preparation and the use of individual techniques or tools described in this document.

Documentation

Documentation is a key element in good estimating practice. The estimate file should be a well organized, easy to follow history from the first estimate at the beginning of the planning phase through preparation of the final estimate. Each estimate should track changes from the previous estimate, updating the scope, assumptions, quantity and price calculations, and risks from the previous estimate. At each update the differences between the previous estimate and the current estimate should be highlighted. This contributes to transparency and accountability in estimating and increases the consistency between estimates.

Clear documentation is particularly important as the project passes from one group to another, or as team member's change. The project estimate file should follow the project through the various stages so that each new estimate can be easily tied to the previous one. Examples of estimate documentation are available on the Cost Risk Assessment website at:

http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment

Techniques

Several techniques can be employed to ensure clear documentation. It is recommended that estimating be specifically scheduled in the project management plan for each phase of the project. This ensures that adequate time is allotted for performing the estimate. A specific schedule should be developed for each estimate, including the steps in Figure 1. As part of the estimate review process, someone external to the project team should perform a review of the estimate file. This will assist the estimator in clearly recording the assumptions and decisions made in the estimating process.

Preliminary Engineering Costs

Preliminary Engineering (PE) percentages can be used at early stages (planning and scoping) to estimate the cost of design for a project. These percentages will vary by project type and total dollar amount of the project. On average, PE costs for WSDOT designed projects are approximately 15% of project cost. This should be used as a starting point, and adjusted according to Table 3 for the specific project type and cost range. As the project moves through design, the PE cost should reflect actual costs to date plus the anticipated costs from the work plan. There is a reasonable minimum cost for PE, including the cost of the Ad, Bid and Award process, which even a very small project will incur. If the project is under $200,000, it might be more efficient to combine it with another project to avoid the additional cost of the PE process.

For projects that include consultant design, PE costs can be significantly different than for projects designed by WSDOT. Consultant costs are almost always more than the typical WSDOT design costs due to several factors. PE costs should be increased by up to 2.8 times the WSDOT cost, depending on the size of the project and the number of consultants involved in the design effort.

IMPROVEMENT PROGRAM PE as % of CN			I1 Mobility				I2 Safety			I3 Economic Initiative			I4 Environmental Retrofit	
Subprogram			IA Urban	IB Rural	IC Urban Bike Connection	IQ HOV Lane	ID Collision Reduction	IE Collision Prevention	IF All Weather Highway	IG Trunk System Completion	IH New Safety Rest Area	II Bridge Restriction	IK Storm water Runoff	IL Fish Barrier Removal
$0	-	$250,000	ND	ND	ND	ND	40%	20%	ND	ND	ND	ND	40%	40%
$250,000	-	$500,000	ND	ND	15%	ND	30%	20%	ND	ND	ND	ND	25%	30%
$500,000	-	$1,000,000	ND	ND	ND	ND	22%	20%	ND	ND	ND	ND	20%	20%
$1,000,000	-	$2,000,000	15%	20%	12%	ND	20%	20%	ND	ND	ND	ND	20%	15%
$2,000,000	-	$5,000,000	15%	20%	12%	ND	20%	15%	10%	ND	ND	ND	ND	15%
$5,000,000	-	$10,000,000	15%	ND	ND	10%	12%	15%	10%	ND	ND	ND	ND	ND
$10,000,000	-	+	15%	10%	ND	10%	12%	15%	10%	14%	ND	ND	ND	ND

PRESERVATION PROGRAM PE as % of CN			P1 Roadway	P2 Structures		P3 Other Facilities				
Subprogram			PA Paving Safety Restoration	PB Structure Preservation	PC Catastrophic Reduction	PD Rest Area	PE Unstable Slope	PF Weigh Station	PG Program Support	PH Major Drain Electrical
$0	-	$250,000	15%	20%	40%	20%	30%	ND	ND	30%
$250,000	-	$500,000	12%	15%	30%	20%	20%	ND	ND	20%
$500,000	-	$1,000,000	12%	13%	20%	20%	15%	ND	ND	20%
$1,000,000	-	$2,000,000	10%	12%	13%	ND	10%	ND	ND	20%
$2,000,000	-	$5,000,000	8%	12%	13%	ND	10%	ND	ND	20%
$5,000,000	-	$10,000,000	6%	12%	13%	ND	10%	ND	ND	ND
$10,000,000	-	+	6%	11%	13%	ND	ND	ND	ND	ND

Notes:

1. **The percentages in this table are based on actual WSDOT project costs state wide from July 2001 through March 2007.**
2. **ND indicates that there is no data for this cell.**
3. **Yellow highlighted cells indicate that there is limited data for that cell.**
4. **For project type definitions see below and Plans Preparation Manual section 830.03.**
5. **A factor must be applied to the PE amount for consultant work. Typical factors for the consultant portion of the work range between 1.8 and 2.8, depending on the type and scope of consultant involvement.**

Table 3: Preliminary Engineering Percentage

Many factors influence a project estimate. Several key factors are described in the sections below. More information is available at:

www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/Process/

Geographic Considerations

Geographic considerations can have a profound affect on the selection of unit bid prices. The project's location, whether in an urban, suburban, or rural setting should be considered in establishing bid prices. Depending on standard specifications, some of the cost considerations relating to a project's location may be accounted for in the mobilization bid item.

A project in an urban setting generally has to contend with construction operations occurring in more confined work spaces, greater volumes of traffic, limited hours of operations, night time work, etc. Some of these factors may be offset by availability of local contractors, materials, equipment and personnel.

Projects located in rural settings have factors that affect the establishment of unit bid prices contrary to projects located in urban settings. Construction operations may have less restricted work areas, less traffic to contend with, and additional hours to complete the work; all factors that increase productivity. On the other hand, materials, equipment and personnel may all have to be brought in from out of the area, which may increase costs related to transportation, support, wages, per diem, etc.

On projects that utilize large quantities of aggregate, whether for base, surface, or earthwork, the location of material sources has a large impact on costs. Nearby material sources reduce hauling costs. On rural projects, the cost of bringing in a concrete batch plant, hot mix plant, or similar plants, may increase unit bid prices, but depending on the standard specifications, those costs may be directly attributed to and reflected in the mobilization bid item.

Terrain may also be a consideration in establishing an items cost. Mountainous terrain and steep grades cause production rates to fall, whereas level terrain and straight roadways generally have the opposite effect.

Quantity Considerations

The quantity of a given material on a project impacts the unit cost of constructing and/or supplying that item. This is not just a supply and demand issue, but also one of production efficiency and economy of scale. Generally speaking, the unit price for larger quantities of a given material will be less than smaller quantities. Suppliers offer discounts for larger quantity orders. Mobilization, overhead and profit are all spread out over a larger quantity, thereby reducing their affect on each unit. Waste is also spread over a larger quantity, thereby having a smaller impact on each unit. Larger quantities also give rise to efficiency by gaining experience and expertise in completing the work.

Projects with very large quantities of certain materials may actually cause an increase to the unit bid price. For example, a project with numerous or large structures may affect the market for a particular type of steel, the availability of cement, or even tie up a region's labor resources.

Small quantities of items of work are less cost effective to construct and hence lead to higher unit prices. Not only do suppliers charge more for smaller purchases, in some instances the lot size or the amount that has to be purchased is greater than the needed quantity. Small quantities do not generally allow for high production rates or other efficiencies, thus causing a higher unit cost. Smaller quantity items are also frequently subcontracted out. This practice increases a contractor's overhead and they usually apply a markup to those items.

Item Availability

Materials that are readily available, or ones that are commonly used, are generally less expensive to purchase and install/construct. Materials that are in short supply are more expensive. This should be considered in establishing the unit price.

Scheduling/Lead Time

To be efficient, a contractor needs to schedule his resources including labor, equipment and materials. When a contractor can plan for and maximize his resources, he can become more competitive in his bidding. The lead time however, needs to be considered in the estimating process by estimating the project based upon when it is expected to be built. For example a job that is two seasons long may have the majority of its paving in the first or second year.

Difficult Construction/Site Constraints

Difficult construction and site constraints will increase the cost of construction for a contractor. Placing piles under water, working near active railroads, adjacent (possibly fragile) historical buildings, construction on or near culturally important or environmentally hazardous sites, and limited room to construct an item are all examples of constraints that should be considered.

Estimating Lump Sum Items

From an estimating standpoint, lump sum bid items are often more difficult to use. Lump sum items can reduce administrative costs in contract administration and thus do make sense in some instances. If the work to be performed can be quantified, then a payment method that includes a quantity should be used. However, lump sum bid items are often used when an item of work can only be defined in general terms, such as when the finished product can be defined but not all the components or details can be easily determined. This can make estimating lump sum items difficult for the estimator. The more information and breakdown of a lump sum item that an estimator has to work with, the greater the likelihood that an accurate lump sum estimate can be developed. An estimator should define a lump sum in terms of its simplest, most basic components and should consider other factors that may not be easily estimated. By breaking out a lump sum item into smaller items of work which have historical data, and then applying

reasonable estimated prices to those sub units, the estimator can accurately establish a price for the overall lump sum item.

Using lump sum items typically transfers risk to a contractor, and the contractor may adjust his price upward to take on this risk. Contractors cannot necessarily rely on overruns to cover work that they did not foresee.

Force Account

Force Account is a method of payment that pays the contractor his actual expenses for all labor, materials and equipment to complete the work. Markups for material costs, labor surcharges, and overhead and profit may be added to this figure. The force account method of payment is used primarily for "extra work" (i.e., work that is unforeseen at the time a project is let or advertised and is discovered during construction) or for items of work that are poorly defined and may or may not be used during construction. This second case is the one most frequently encountered by the estimator. Since the contractor does not usually bid on this work, there is little incentive for him to reduce costs or prosecute the work diligently. Because of this, the force account method of payment should only be used when necessary.

When an estimator must establish a reasonable cost for a force account item, he should try to establish the scope of work to be accomplished. Once the scope is developed, it can be compared to historical bid price data for similar items of work. If no comparable history exists, the force account item should be broken out into its anticipated core components. The estimator can then rely on historical bid data for those items and the given limitations to come up with a reasonable force account estimate. If no such data exists for even the smaller core items of work, the estimator may need to estimate the amount and costs of labor, materials and equipment to execute the work, much like what is done when estimating using the cost based method of estimating.

Timing of Advertisement

When a project is advertised and subsequently bid has a major influence on the bid prices. Contractors typically have a time of year that is busier than others. This is normally when contractors prefer to do the majority of their work. This is normally directly correlated with the weather and occurs when the conditions are the most conducive for construction activities.

If a contractor has fully allocated his resources for the season, they are less likely to bid on a project and when they do bid it is in a less competitive environment. For this reason there is a benefit to the transportation agency to advertise a project as soon as possible prior to the peak season, to allow the contractor to plan, schedule and seek as many opportunities as possible to find efficiencies in their work plan. This also creates a more competitive bid climate and lower bid prices.

The estimator preparing the final engineer's estimate needs to be aware of the timing of the advertisement and account for any expected fluctuations in bid prices due to the season, lower production during temperature extremes, additional protections for weather sensitive materials, and so forth.

Expected Competition/Contractor Availability

Projects that are advertised for bids late in the season or after contractors have scheduled their work for the year, can expect higher bid prices. This is due to the lack of competition or contractor availability. Projects that are bid during a period of time when a large number of contractors are available are bid more competitively. Contractors know that they must bid the lowest possible price to be able to get the contract. See Other Contracts below for a reasonable range of cost increase for this factor.

Other Contracts

Multiple projects being advertised at the same time can influence bid prices in much the same way as lack of competition and availability. The contractors only have so many resources available to develop bids for projects. In the case of large projects, a contractor may not have the resources to develop bids for more than one project at a time. The most prudent course of action in this case is to manage the program of projects to ensure that this does not become an influencing factor on the bids. If this cannot be prevented, then the estimate needs to reflect that multiple bids will be developed at the same time. Typically with four or more bidders the effect on the bid amount is negligible. The estimator should consider to what extent the reduction below the normal number of bidders will influence the bid amount. A reasonable range of impact is a 0% to 8% increase over the engineer's estimate for construction. The probability of the occurrence of this risk will be determined by the estimator. Common mitigation strategies include timing of the Ad and work packaging.

Another factor to consider in a multiple contract environment is the resources required for the projects and if multiple active projects will create conflicts in an area. For example, multiple large-scale bridge projects in a given area may create a shortage in structural steel or skilled labor. In these cases the estimator must be aware of the ability of the market to support multiple projects.

Having multiple contracts in an area may create conflicts between the projects. These could include traffic control, labor issues, direct coordination issues, and similar issues. These conflicts need to be considered in the calculation of production rates and subsequent bid item prices. Project managers should be aware of adjoining projects and nearby work, even from other regions. There may be opportunities for collaboration and coordination that will result in more competitive bids and better maintenance of traffic.

Specialty Work

Specialty items are not necessarily new items or new construction methods, but are items that are somehow different than the majority of the work on a given project. On a pavement rehabilitation project, signal work may be classified as specialty work, although it would not be on a project that was predominately signal and lighting work. Projects that include specialty work or are comprised totally of specialty work items need to be characterized correctly when estimating. Estimating specialty work or bid items requires a thorough understanding of the work involved and the resources required to accomplish the work.

When estimating specialty work seek the advice of experts in the area of concern. When estimating specialty items utilizing historical bid data, the similarities and differences between the work must be fully accounted for in the development of the estimate. Another factor to consider is the number of qualified contractors capable of doing the project or elements of work. Other examples of specialty work may be landscape, guideposts, fencing or mechanical rehabilitation of moveable bridge components. Specialty work should be reviewed by staff who are familiar with that particular type of work.

First Time Used

On occasion, items of work are included in a project that the transportation agency has little or no historical data to use to establish unit prices. In these instances, similar items may provide some guidance, but additional investigative work may be necessary. If the item is thought to be of minor significance, there may be little benefit in spending much time in determining a reasonable bid price. If the item is considered major or is likely to be significant to the bid, research should be conducted to establish a cost. Contacting others who are familiar in the use of the item can usually help in determining a cost. Suppliers, other state departments of transportation, the Strategic Assessment and Estimating Office (SAEO) at WSDOT HQ, Regional Transportation Commissions, Port Authorities, Consultant Letting, R.S. Means Publications, and even contractors can be valuable resources in establishing costs. Be wary in relying on estimates from a single contractor or source; multiple sources should be utilized.

If the item in question is unique in some manner, whether it is innovative, new or experimental, or is considered a specialty item, costs may need to be adjusted to account for the contractor's lack of experience with it and the potential increased risk in construction. If the work is likely to be subcontracted out, the prime contractor may also add a markup to the subcontractor's price.

Right of Way

Right of Way costs vary widely throughout Washington State. Region Real Estate Services or the HQ Real Estate group should be involved early to help determine appropriate costs for the project. It is important that all support groups detail what is included and what is not included in their estimate. Factors that should be considered in the Right of Way estimate include administration, relocation, clean up costs and allowances for condemnation.

Real estate markets are best characterized by those familiar with the geographic area. In consideration of this fact, subject matter experts such as region real estate services and region right of way staff should be asked to provide this estimate. These SMEs can provide input regarding the cost of right-of-way and the uncertainty associated with the real estate market in the geographic area of the project. Other issues to consider include zoning changes, speculation, and growth management plan or comprehensive plan changes.

Environmental

The Environmental Office needs to be involved in the process early. Permits, Memorandums of Understanding, Agreements, Other Agency Requirements, RCW's, Environmental laws, and community involvement in environmental issues can all increase costs to an estimate.

Utilities

Utilities are found on a majority of projects and when there are conflicts they can increase a projects cost dramatically. When a utility company is on an easement and WSDOT acquires the property through R/W acquisitions, WSDOT must pay all relocation costs plus putting the utility onto a new easement.

Another area that may effect costs is unidentified utilities being impacted – either they were missed or they are underground and there was not sufficient engineering investigation to properly locate the utility.

Soil Conditions

General assumptions about soil conditions may be made early on in the estimating process, but they may be wrong. As the estimate progresses, geotechnical data may help improve the information. In the early estimates the assumptions regarding soil conditions and the potential effects of unknown soil conditions should be clearly documented. A common estimate omission is shrink and swell of material. The region materials engineer should be consulted to determine the appropriate shrink or swell factor to use. Soil conditions can be a significant cost risk to a project. Risk based estimating techniques should be utilized to quantify geotechnical risks if they pose a significant threat or opportunity.

Permit Conditions

Throughout the stages of planning, scoping, and design, various projections of permit conditions for construction can be obtained from region or HQ Environmental Offices. Engaging these groups early may help identify specific permits or conditions that can drive up construction costs and identify opportunities to avoid costly environmental conflicts.

Contingencies

Please refer to the definition of contingency provided in the Definitions section of this document. Allowances (contingency funds) are typically meant to cover a variety of possible events and problems that are not specifically identified or quantified. They are also used to account for a lack of project definition during the preparation of planning estimates. Misuse and failure to define what specific allowances amounts cover can lead to estimate problems. It is a mistake to use allowances or contingency funds to cover added scope as the contingency is then not available to cover the risk item(s) for which it was originally intended.

In WSDOT estimates, allowances should be shown separate from the base cost. Allowance amounts should be identified with specific unknowns or risks so they can be managed appropriately as the design progresses. This will assist in review of the estimate and help designers and project managers manage the risk. Contingency amount guidance during construction can be found in the Plans Preparation Manual section 830.03.

Each estimate should have some level of review, as indicated on the flow chart provided in Figure 1, *Cost Estimating Process*. Project complexity is the most important driver of the level of estimate review. The level of review should be carefully chosen by the project manager.

Independent reviews (check estimates) should be made by experienced estimators who are familiar with the type of work inherent in the project, and who have had no involvement in the development of the project estimate thus far. The independent estimator consults with other independent sources such as design engineers, construction managers, or other estimators as needed on specialty items of work. Checks performed by independent estimators will include but not be limited to:

- Reviewing the Estimate file and Basis of Estimate documents for completeness and readability
- Ensuring that the name(s) of estimator(s) involved in preparing the estimate are shown
- Ensuring that the estimating methodologies are noted by individual item of work
- Reviewing the overall estimate documentation to ensure that it is clear and that figures are traceable, from detailed back-up to summary levels
- Conducting a detailed check of the estimate:
  - Check the development of unit rates and quantities of those items that drive the majority of the bottom-line cost (the 20% of the items that comprise 80% of the estimated cost)
  - Make note of comments on unit rates and quantities
  - Check for mathematical errors

Inclusion of Risk; the CRA and CEVP

WSDOT policy requires a CRA for projects over $25 M and a CEVP for projects over $100 million. These processes both include an estimate review. For projects less than $25 million, there are several levels of estimate review that can be used. It is recommended that all projects undergo at least an internal project team review for each estimate update. A peer review or region review should be considered for each estimate that is complex or includes significant changes to scope or design development. A region/ headquarters, or external estimate review should be considered for all projects over $10 million or projects that are complex during the design phase. Each estimate review should be thoroughly documented and any changes made to the estimate as a result of the review clearly shown. The WSDOT policy for CRA and CEVP is available at:

http://www.wsdot.wa.gov/NR/rdonlyres/EF230F3B-1FC1-4A2A-9FC9-B66CF0300E1E/0/%20PolicyforCostRisk%20Assessment20050805.pdf.

Internal Project Team

This type of review is the first level of estimate review and in recommended for all estimates. The advantages are that the project team's schedule is easier to coordinate than outside resources and the reviewers have a base knowledge of the project. A

disadvantage is that internal reviews tend to be conducted with the same vision, framework, and assumptions as the project teams. This can lead to a review that does not objectively assess all the parameters that effect the estimate.

One useful double check for project teams includes preparing estimates in two different ways and then comparing. For example, if a project team utilizes historical bid-based methods for preparing the project cost estimate, consider selecting the top 5 to 10 items in terms of cost and estimate them using a cost-based approach (materials, equipment and labor), then compare the estimates.

Peer Review

This type of review is similar to the internal project team review, but uses another project team or office to conduct the review. Offices can often perform reviews for each other in this way. The advantage to this type of review over the internal review is that the project gets a review with a fresh perspective on the estimate. This provides an increased level of confidence in the estimate.

Region/Headquarters Review

This type of review at the region and headquarters level is typically more formal. One advantage to this type of review is that the reviewers are external to the project team, thus providing an independent perspective on the project. However, the biggest advantage is that the reviewers typically have significantly more experience in performing this type of independent review. Region reviews can be coordinated with region staff. HQ reviews should be coordinated with SAEO staff. Their contact information can be found on the CRA or CEVP websites.

External

In this type of review, external experts are brought in to review specific pieces or the entire estimate. This type of review can be combined with any of the other types of reviews to supplement knowledge of a specific item of work or to provide an outside perspective. This type of review has a wide range of costs, but can provide significant confidence in the estimate.

Changes, Including Scope Changes, Schedule Changes, Budget Requests	PE/PM through region PDE or EM must process Control Change Form through the Project Control and Reporting Office
Planning Level	Region Planning Manager
Scoping Level, including: Design Documentation Package (DDP)	Region Plans Office and Programming
Design Approval Design Report Alternative Analysis	PE/PM, PDE/EM, and Region Plans Office
Determine Contingencies	PE/PM, PDE/EM
PS&E Level Estimates	Estimator, Designer, and PE/PM
Documentation, including: Assumptions Quantities and adjustments Prices and adjustments	Estimator, Designer, and PE/PM
Review Estimates	Region Plans Office, and Peer Review Team
Check Estimates and Calculations	Region Plans Office,
Prepare Engineer's Estimate	Estimator, Designer, and PE/PM
Independent Estimate	To be determined

Table 4: Activity/Responsibility Matrix

ASDE – Assistant State Design Engineer EM – Engineering Manager PC&R – Project Control and Reporting	PE – Project Engineer PM – Project Manager PDE – Project Development Engineer

Note

The Region Project Engineer, Project Manager, Project Development Engineer, and Engineering Manager should be informed of changes and updates to project scope, schedule, and cost estimates. This table is based on the Project Control and Reporting Manual (M 3026) January 2006 revision.

CPMS CCI Tables: wwwi.wsdot.wa.gov/ppsc/pgmmgt/cpms/fields/cci.txt

CPMS RWCI Tables: wwwi.wsdot.wa.gov/ppsc/pgmmgt/cpms/fields/RW.INFL.TXT

CPMS PECI Tables : wwwi.wsdot.wa.gov/ppsc/pgmmgt/cpms/fields/PE.INFL.TXT

Bridge Design Manual (Ch. 12, Appendix 12-A):
http://www.wsdot.wa.gov/fasc/EngineeringPublications/BDM.htm

EBASE (Estimates and Bid Analysis System):
www.wsdot.wa.gov/EESC/Design/projectdev/AdReady/EBASE.htm

Oman Systems BidTabs Professional (see your IT to setup):
http://www.wsdot.wa.gov/EESC/Design/projectdev/AdReady/BidTabsProProgram.htm

WSDOT Project Bid Results and Contract Awards: www.wsdot.wa.gov/biz/contaa/BIDSTATS/

Cost Estimate Process:
http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/Process/

CEVP Guidelines and Glossary:
http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/workshop.htm

Estimating Tips and Watch-outs: http://www.wsdot.wa.gov/NR/rdonlyres/76111703-D435-4CB7-A965-1297F7F00599/30323/ESTIMATINGTIPSWATCHOUTS.doc

Instructional Letter: Inflation and Market Conditions Applied To Base Estimate
http://wwwi.wsdot.wa.gov/docs/OperatingRulesProcedures/4071.pdf

Online Project Management Guide:
http://wwwi.wsdot.wa.gov/OneDOT/News/2005/07/05_0627ProjectOnlineGuide.htm

Self-Modeling Excel worksheet: http://www.wsdot.wa.gov/publications/fulltext/CEVP/Self-Modeling-RMP.xls

RS Means: http://www.rsmeans.com/

Estimate Documentation Examples:

Estimate Examples for each project stage:

From: _____ Date: _____

_____ Phone: _____

_____

To: WSDOT *(Cost Estimating Guidance*)
Headquarters SAEO Office
Mail Stop 47330
PO Box 47330
Olympia, WA 98504-7330

Subject: *Cost Estimating Guidance* Comment

Comment (marked copies attached):

Preserve this original for future use • Submit copies only